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10/737,222	12/15/2003	David K. Biegelsen	D/A3598	7697

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DOUGHERTY, THOMAS M	

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2834	

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Please find below and/or attached an Office communication concerning this application or proceeding.

H'A

Office Action Summary	Application No.	Applicant(s)	
	10/737,222	BIEGELSEN ET AL.	
	Examiner	Art Unit	
	Thomas M. Dougherty	2834	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 January 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-29 and 35-40* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *4,5,26 and 27* is/are allowed.

6)☒ Claim(s) *1-3,6,8,10-14,16-25,28,29 and 35-40* is/are rejected.

7)☒ Claim(s) *7,9 and 15* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *13 January 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments filed 1/13/06 have been fully considered but they are not persuasive. The applicant notes that Mori shows his piezoelectric elements 1 and 2 are positioned at a 120 degree angle and that the motion generated is in a lateral plane. It appears however that elements 1 and 2 are positioned at a 90 degree angle relative to each other for example in Mori's figure 1, where each element makes a 45 degree angle with the horizontal. These angular relationships are identical to those of the Applicant's in their figure 1 which is not noted as a prior art figure. Although Mori's contact element (10) is a different shape in his fig. 1 than the Applicants' shape, the Applicants themselves note that "Contact element 104 may be arbitrarily shaped" at paragraph 27 of the disclosure. Thus this difference doesn't carry patentable weight at this time, particularly as it is noted as a design choice by the applicants and because Mori too shows a plurality of shapes for use in his invention, for example, he shows a partially spherical shape in fig. 6. Note in his fig. 6 also that his first and second directions are orthogonal to each other, for example the motion of piezoelectric element 1 is shown as 5 and that of piezoelectric element 2 is shown as 6; these are clearly orthogonal to each other. Note also that the orbit in figure 7, which is 70, clearly is elliptical, which is identical in shape to the orbits shown by the Applicants.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 40 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 40 cites "the transfer element" which has no proper antecedent basis. It is suspected that claim 40 was meant to depend on claim 26, which does cite a "transfer element".

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3, 13, 14, 16, 20-22, 25, 28 and 29 are rejected under 35 U.S.C. 102(b) as being anticipated by Mori et al. (US 4,613,782). Mori et al. show (fig. 6) a biaxial piezoelectric motor comprising: a contact element (60), the contact element (60) to include at least one point to contact an object (11) to be moved; a first piezoelectric driver (1) coupled to one side of the contact element (60), when energized, the first piezoelectric driver (1) to move the object in a first direction approximately tangential to the surface of the contact element at the at least one point of contact, note that the motion with the applicant's invention is

elliptical, as is Mori's et al. ; and, a second piezoelectric driver (2) to move the object in a second direction approximately tangential to the surface of the contact element at the at least one point of contact, the first direction and the second direction to form an angle other than 180 degrees to enable movement of the object in a two dimensional plane.

The contact element (60) is hemispherical in shape (at 10).

The first direction and the second direction are orthogonal.

The contact element (60) interacts with an opposite surface (fig. 5) to increase friction on the object (11) to be moved.

In their figure 5, Mori et al. show the opposite surface being a second biaxial piezoelectric motor.

A transfer element (10) is interposed between the contact element (60) and the object (11) to be moved.

The contact element (60) contacts the object (11) to be moved at only one point.

Recitation of the output frequency or size of the contact element in relation to it is a method of operating or using the device. Obviously one could choose to drive the device with a frequency such that the wavelength is longer than the size of the contact element. It has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. Ex parte Masham 2 USPQ2d 1647 (1987).

As Mori et al. show the structural features of the invention as claimed by the Applicants, the interface between the piezoelectrics and the contact element is regarded as being is a single plane parallel to the two dimensional plane in which the object moves. Note that Mori et al. show in a variety of figures the contact surface connected to either piezoelectric drive element on a single plane surface at the interfaces.

The contact is textured, necessarily, to impart additional lateral motion to the object. Note that this is so or else the member to be moved would slip, thus acting against the intent of the invention.

In their figure 4, Mori et al. show at least three separate motors surrounding a member to be moved. Recitation of the directionality of motion of the object to be moved is regarded as a goal of the invention, as Mori et al. show the claimed number of piezoelectric elements and contacts i.e. the claimed structural features are met by Mori et al., the intended driving directions are regarded as being met. Note that the Applicants do not disclose specific locations of their elements in relation to the object to be moved.

Claims 1-3, 13 and 20-22 are rejected under 35 U.S.C. 102(b) as being anticipated by Matsuo et al. (US 2002/0038988 A1). Matsuo et al. show (fig. 1) a biaxial piezoelectric motor comprising: a contact element (200), the contact element (200) to include at least one point to contact an object (R) to be moved; a first piezoelectric driver (100) coupled to one side of the contact element (200), when energized, the first piezoelectric driver (100) to move the object in a first direction approximately tangential to the surface of the contact element at the at

least one point of contact; and, a second piezoelectric driver (also 100) to move the object (R) in a second direction approximately tangential to the surface of the contact element at the at least one point of contact, the first direction and the second direction to form an angle other than 180 degrees to enable movement of the object (R) in a two dimensional plane.

The contact element (200) is hemispherical in shape.

The first direction and the second direction are orthogonal.

The contact element (200) interacts with an opposite surface (surface of R is opposite to 200) to increase friction on the object (200) to be moved.

The contact element (200) contacts the object (R) to be moved at only one point.

Recitation of the output frequency or size of the contact element in relation to it is a method of operating or using the device. Obviously one could choose to drive the device with a frequency such that the wavelength is longer than the size of the contact element. It has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. Ex parte Masham 2 USPQ2d 1647 (1987).

As Matsuo et al. show the structural features of the invention as claimed by the Applicants, the interface between the piezoelectrics and the contact element is regarded as being is a single plane parallel to the two dimensional plane in which the object moves. Note that Matsuo et al. show in a variety of

figures the contact surface connected to either piezoelectric drive element on a single plane surface at the interfaces.

Claims 1-3, 6, 8, 10, 13, 16 and 20-22 are rejected under 35 U.S.C. 102(b) as being anticipated by Shibatani et al. (US 6,661,154). Shibatani et al. show (fig. 1) a biaxial piezoelectric motor comprising: a contact element (5), the contact element (5) to include at least one point to contact an object (10) to be moved; a first piezoelectric driver (2) coupled to one side of the contact element (5), when energized, the first piezoelectric driver (2) to move the object in a first direction approximately tangential to the surface of the contact element at the at least one point of contact; and, a second piezoelectric driver (3) to move the object in a second direction approximately tangential to the surface of the contact element at the at least one point of contact, the first direction and the second direction to form an angle other than 180 degrees to enable movement of the object in a two dimensional plane.

The contact element (5) is hemispherical in shape.

The first direction and the second direction are orthogonal.

Drive circuitry (see fig. 9) coupled to the first piezoelectric driver (2) and the second piezoelectric driver (3), the drive circuitry to determine a desired direction and amplitude of motion for the object, the drive circuitry including a processor (21) that computes the voltage amplitude (output of 19) applied to the first piezoelectric a (2) and the voltage amplitude (output of 20) applied to the second piezoelectric (3) to move the object in the desired direction. Note that as these features are not shown in the figures, they are largely regarded as a goal

of the invention which is not adequately supported by the disclosure including the figures, as noted above in the paragraph under the Drawings heading.

The ratio of voltage amplitude applied to the first piezoelectric driver (2) to the voltage amplitude applied to the second piezoelectric driver (3) is equal to the ratio of the cosine of the angle formed between the desired direction and the first direction and the cosine of the angle between the desired direction and the second direction. Note in figure 1 that the motion of the contact member (5) is circular, therefore each piezoelectric driver provides the same amplitude and drive frequency, as they are orthogonally positioned, it can be determined that the ratio is the same for each driver.

A sensor (current detector, 16, 17) determines the position of the object and provides feedback to the drive circuitry.

The contact element (5) interacts with an opposite surface to increase friction on the object (10) to be moved.

The contact element (5) contacts the object (10) to be moved at only one point.

Recitation of the output frequency or size of the contact element in relation to it is a method of operating or using the device. Obviously one could choose to drive the device with a frequency such that the wavelength is longer than the size of the contact element. It has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. Ex parte Masham 2 USPQ2d 1647 (1987).

As Shibatani shows the structural features of the invention as claimed by the Applicants, the interface between the piezoelectrics and the contact element is regarded as being is a single plane parallel to the two dimensional plane in which the object moves. Note that Sibatani shows in a variety of figures the contact surface connected to either piezoelectric drive element on a single plane surface at the interfaces.

Claim 35-38 rejected under 35 U.S.C. 102(b) as being anticipated by Stauffenberg et al. (US 4,727,278). Stauffenberg et al. show (figs. 21-23) a plurality of biaxial motors (e.g. 522) to move an object comprising at least: a first biaxial piezoelectric motor (522 in fig. 21) including first piezoelectric driver (532) coupled to one side of a contact element (534), when energized, the first piezoelectric driver to move the object (in this case the motor is in the device of fig. 23, and the object to be moved is placed in the device andmay be translated an/or rotated "in the plane of an adjacent protective annular ring 580", see col. 16, lines 16-31, in a first direction approximately tangential to the at least one point of contact, the first biaxial piezoelectric motor further including a second piezoelectric driver coupled to a second side of the contact element, the second piezoelectric to move the object in a second direction approximately tangential to the at least one point of contact, the first direction and the second direction to form an angle other than 180 degrees to enable movement of the object in a two dimensional plane, and, a second biaxial piezoelectric motor including a corresponding first piezoelectric driver of the second biaxial piezoelectric motor, the corresponding first driver coupled to one side of a second contact element,

when energized, the corresponding first piezoelectric driver to move the object in a third direction, the second biaxial piezoelectric motor further including a corresponding second piezoelectric driver of the second biaxial piezoelectric motor coupled to a second side of the second contact element, the corresponding second piezoelectric to move the object in a fourth direction. Note that this is inherent, the piezoelectric motor of fig. 21 is employed in device of fig. 23, which must have a plurality of these motors in order to cause translation and rotation to a movable object.

The first contact element (534) interacts with a third biaxial motor on the opposited surface of the object to be moved. Note that in fig. 21, the structure includes two opposing motors to generate linear motion; to generate rotational motions, at least another motor is required, for including for example 410 and 412 in fig. 20. These comprise a biaxial motor.

The plurality of biaxial motors further comprising a third biaxial motor. Note that linear motion (translational) is effected by two such piezoelectric motors (522 and 524). To generate both translation and rotational motion, more than two such motors are required in the Stauffenberg et al. device.

As noted by Stauffenberg et al, the first biaxial motor and the second biaxial motor work together to enable rotation of the object.

Claim 39 is rejected under 35 U.S.C. 102(b) as being anticipated by Stauffenberg et al. (US 4,727,278). Stauffenberg et al. show (fig. 21) a biaxial piezoelectric motor (522) comprising: a contact element (534), the contact

element (534) to include at least one point to contact an object to be moved (540); a first piezoelectric driver (532) coupled to one side of the contact element (534), when energized, the first piezoelectric driver (532) to move the object in a first lateral direction and, a second piezoelectric driver (also 532) coupled to a second side of the contact element (534), the piezoelectric (532) to move the object (540) in a second lateral direction, the first lateral direction and the second lateral direction oriented such that the object can be moved with at least two degrees of freedom in a two dimensional plane oriented approximately tangent to the surface of the contact element where the contact element (534) contacts the element (540) to be moved.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 11, 12 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shibatani (US 6,661,154) in view of Frey (US 5,598,051). Given the invention of Shibatani as noted above, he doesn't discuss the location of his circuitry on a PCB.

Frey teaches (fig. 3) piezoelectric elements (4A, 4B) where at least one is directly mounted on a PCB (6) which has conductive traces. Frey further notes

that the conductive traces may be on a substrate which is insulative (col. 4, ll. 1-12).

It would have been obvious to one having ordinary skill in the art to use a ceramic PCB with appropriate traces for mounting the drive circuitry and piezoelectric and contact elements of Shibatani for its insulative properties as Frey teaches. Note that the choice of material for the PCB is a clear design choice based on designer preference. Note on page 7 of the disclosure that the applicants themselves say that "The PCB can be made of various materials such as fiber re-enforced epoxy, ceramics, and plastics."

Claims 17-19, 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shibatani (US 6,661,154) in view of Maeno et al. (US 6,404,104). Given the invention of Shibatani as noted above, he does not show a spherical contact member.

Maeno et al. show (e.g. fig. 13) a spherical contact surface (42).

Maeno et al. don't show two piezoelectric drivers connected to the contact member and don't note the material employed for the contact member.

It would have been obvious to one having ordinary skill in the art to employ the spherical contact surface of Maeno et al. in the device of Shibatani because such a shape would provide for a multi-degree of freedom of motion in the device as Maeno et al. note at col. 2, ll. 53-55.

Regarding the coating or the material of the contact member, it would have been obvious to one having ordinary skill in the art to employ a metal, plastic or ceramic contact member, including one that is coated with a thin layer,

textured or not, in the combined device of Shibatani and Maeno et al. at the time the invention was made, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416. The applicants themselves note that the "contact element 104 may be made of a number of substances" at page 3, paragraph 17, line 1 of the disclosure.

Allowable Subject Matter

Claims 4 and 5 are allowed.

Claims 26 and 27 are allowed.

The following is an examiner's statement of reasons for allowance: Claims 26 and 27 show motion of an object coupled to a transfer element via the transfer element's surface, which transfer element is contacted by two contacts each associated with its own piezoelectric element, and through this structure, at least three degrees of freedom in a plane approximately tangential to the surface of the transfer element where the transfer element contacts the object to be moved is achieved.

Claim 7, 9 and 15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: regarding claims 7 and 9 which have not previously been indicated as containing allowable subject matter, the prior art does not teach

adjusting the individual frequencies of a first and second piezoelectric element coupled via a contact member to each other, where the ratio of the two frequencies determines the direction of motion of an object which the two elements drive, and where a higher frequency represents an increase in amplitude of motion.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Additional prior art cited reads on claimed aspects of the invention.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will

the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Direct inquiry to Examiner Dougherty at (571) 272-2022.

tmd

tmd

March 1, 2006

TOM DOUGHERTY
PRIMARY EXAMINER